Don't WARC Away: Preservation Metadata & Web Archives

Jefferson Bailey & Maria LaCalle, Internet Archive

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@jefferson_bail | maria@archive.org

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- We are a non-profit Digital Library & Archive founded in 1996
- 20+PB unique data: 10PB web, ~8m text, 2m vid, 2m aud, 100K soft, etc
- We work in a former church and it's awesome
- Developed: Heritrix, Wayback, warcprox, Umbra, NutchWax, ARC format
- Engineers, librarians/archivists, program staff

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WayBack Machine

- https://archive.org/web
- Largest and oldest publicly available web archive in existence
- 485,000,000,000+ URLs (that's billions)
- Like a billion websites, domain agnostic
- Content in 40+ Languages
- Periodic snapshot; 1b+ URLs per week

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- https://archive-it.org/
- Web archiving service used by 370+ institutions
- 3500+ collection, 10 billion+ URLs
- 49 states and 19 countries
- Libraries, archives, museums, governments, non-profits, etc.
- User groups, Annual Meeting, collaborative and educational projects

What is a web archive?

- **Web archiving** is the process of collecting portions of web content, preserving the collections, and then providing access to the archives - for use and re use.

- A **web archive** is a collection of archived URLs grouped by theme, event, subject area, or web address.

- A **web archive** contains as much as possible from the original resources and documents the change over time. It recreates the experience a user would have had if they had visited the live site on the day it was archived.

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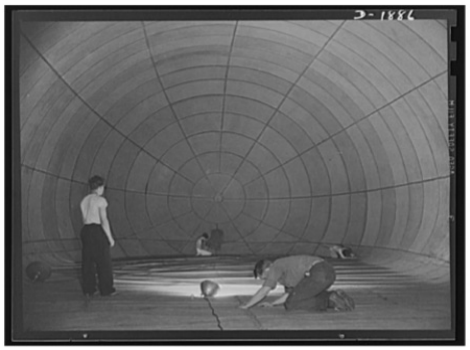
Web archive community



NDSA 2013 Survey

- 70% of respondents using Archive-It
- 17% were using California Digital Library's Web Archiving Service
- 81% of organizations devoting one half FTE or less to web archiving

IIPC 2013 Survey

Is your web archiving collection integrated in your preservation system?

37% Yes

26% Planning to

37% Have not integrated their web collection

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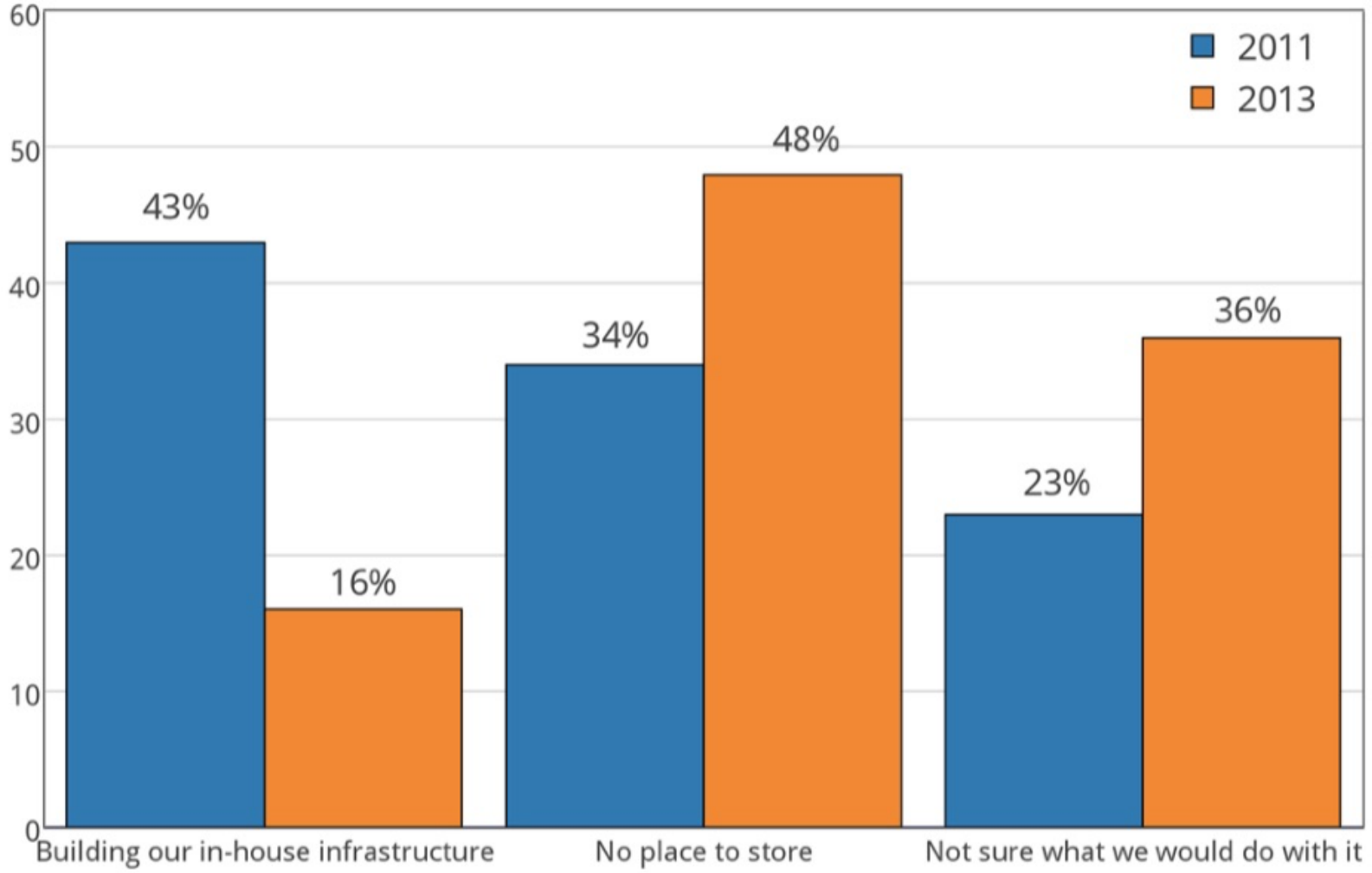
REASONS FOR NOT TRANSFERRING DATA FROM AN EXTERNAL SERVICE



Format Obsolescence: the David Rosenthal perspective

The vast majority of information generated today will not survive 100 years for reasons that have nothing to do with the interpretability of the bits.

WARC (Web ARChive) Format

- ISO 28500:2009
- Combines multiple digital resources into an aggregate archival file together with related information
- Container file
- Written by crawlers
- Concatenated raw content
- For long-term storage and preservation

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WARC: the What and What Not

The What

- Four required fields:
  - Record Identifier (URI)
  - Content Length/ Record Body Size
  - Timestamp
  - WARC Record Type: 8 different types but most common is the archived response/resource (HTML, pdf, JavaScript…)
- WARCs contain extensive technical metadata

The What Not

- Rights and permissions
- Descriptions
- Agents & Events
- File format identification
- Validation
- Characterization

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WARC: The Guts

The eight types of WARC records:

- warcinfo – defines records that follow
- response – scheme-specific response (full http response)
- resource – direct retrieval w/o protocol
- request – full http request w/ headers
- metadata – further describe/explain harvested resource (hopsFromSeed, fetchTime)
- revisit – revisitation of previously archived content (dedupe)
- conversion – transformations
- continuation – completion across segmentation

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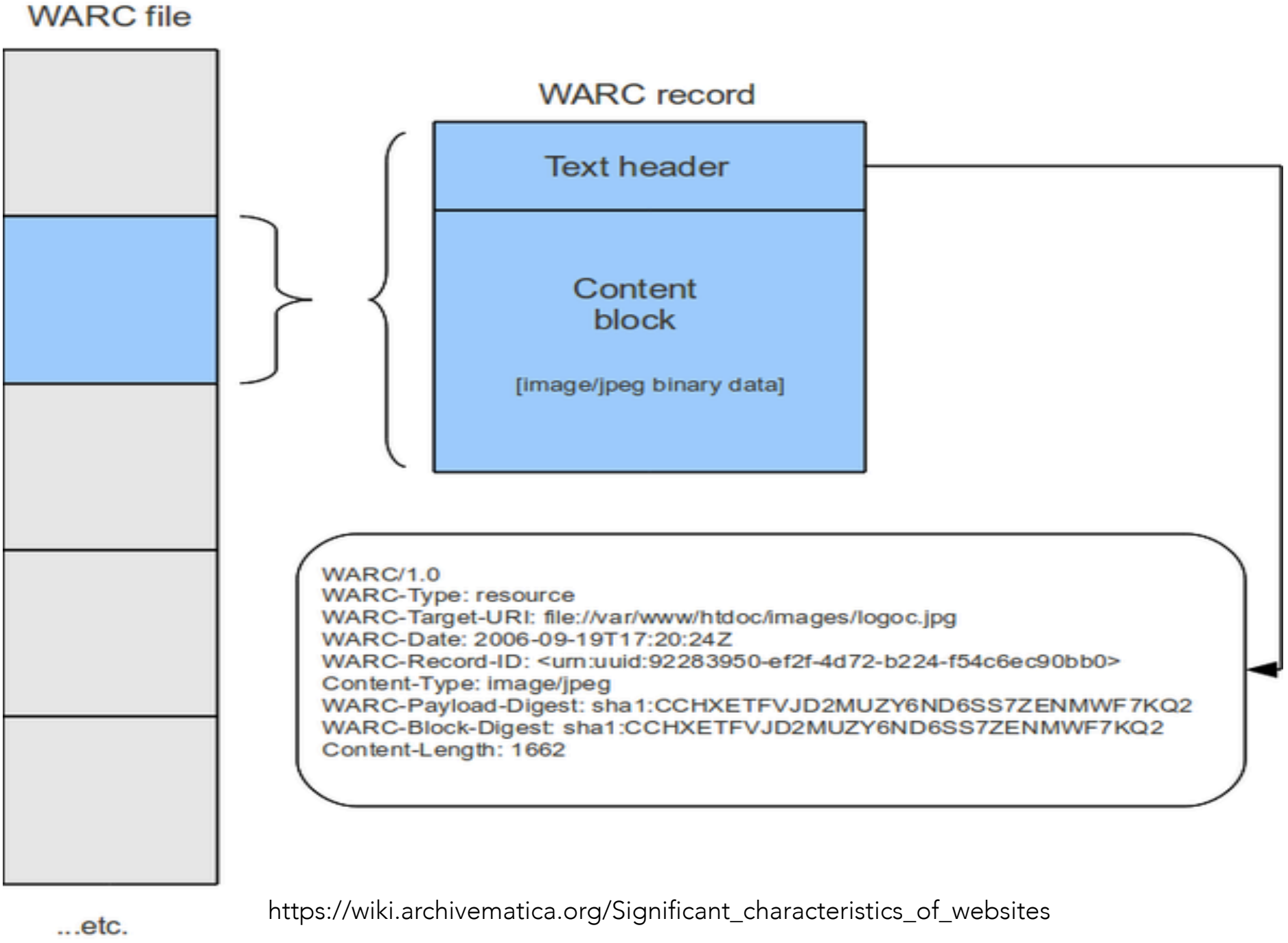

https://wiki.archivematica.org/Significant_characteristics_of_websites

ARCHIVEIT-3336-DAILY-26569-20141107000046608-00000-wbgrp-crawl051.us.archive.org-6442.warc

```
4107 WARC/1.0
4108 WARC-Type: response
4109 WARC-Target-URI: http://sfbay.craigslist.org/sfc/roo/4727260590.html
4110 WARC-Date: 2014-11-07T00:00:56Z
4111 WARC-Payload-Digest: sha1:XLKPTY4QQOF24LEBJYDMUIINKENXU5AO
4112 WARC-IP-Address: 208.82.238.146
4113 WARC-Record-ID: <urn:uuid:6ef7262f-515b-4f3d-8c28-2e00b28b9161>
4114 Content-Type: application/http; msgtype=response
4115 Content-Length: 13253
4116
4117 HTTP/1.1 200 OK
4118 Connection: close
4119 Cache-Control: max-age=300, public
4120 Last-Modified: Fri, 07 Nov 2014 00:00:56 GMT
4121 Date: Fri, 07 Nov 2014 00:00:56 GMT
4122 Vary: Accept-Encoding
4123 Content-Type: text/html; charset=UTF-8
4124 X-MCP-Cache-Control: max-age=2592000, public
4125 X-Frame-Options: SAMEORIGIN
4126 Server: Apache
4127 Expires: Fri, 07 Nov 2014 00:05:56 GMT
4128
4129 <!DOCTYPE html>
4130 <html class="no-js">
4131 <head>
4132     <title>master bedroom with a pirate bathroom in a 3b/2b apartment.  $1520/m</title>
4133     <meta name="robots" content="NOARCHIVE,NOFOLLOW">
4134     <meta name="description" content="Hi there, We are looking for one new roommate to fill our 3b/2b apartment at 320 Capp St. The
         room is available on Nov. 9th-ish. If you're interested, please reply with a bit about yourself and your...">
4135     <meta name="twitter:card" content="preview">
4136     <meta property="og:description" content="Hi there, We are looking for one new roommate to fill our 3b/2b apartment at 320 Capp
         St. The room is available on Nov. 9th-ish. If you're interested, please reply with a bit about yourself and your...">
4137     <meta property="og:image" content="http://images.craigslist.org/00p0p_l3IbaeevjXx_600x450.jpg">
4138     <meta property="og:site_name" content="craigslist">
4139     <meta property="og:title" content="master bedroom with a pirate bathroom in a 3b/2b apartment. $1520/m">
4140     <meta property="og:type" content="article">
4141     <meta property="og:url" content="http://sfbay.craigslist.org/sfc/roo/4727260590.html">
4142     <meta name="viewport" content="initial-scale=1.0, user-scalable=1">
4143     <link type="text/css" rel="stylesheet" media="all" href="//www.craigslist.org/styles/cl.css?v=d7d4e51d9bac1e78a31bb15f752864cf">
4144     <link type="text/css" rel="stylesheet" media="all" href="//www.craigslist.org/styles/leaflet-stock.
         css?v=ea2cbe352bcad5eae1c267a9dd15a5c1">
4145     <!--[if lt IE 9]>
4146 <script src="//www.craigslist.org/js/html5shiv.min.js?v=42e8031bc7ca9d67a48f4a5feff7bf29" type="text/javascript" ></script>
4147 <![endif]-->
4148 <!--[if lte IE 7]>
4149 <script src="//www.craigslist.org/js/json2.min.js?v=178d4ad319e0e0b4a451b15e49b71bec" type="text/javascript" ></script>
4150 <![endif]-->
```

Challenges to Preservation Metadata

- Concatenated nature
  - Unpack every resource?
- Dispersed for storage
  - Arbitrary placement of resources in WARC files
  - Duplication / revisit
- Unreliable mimes + format verification/obsolescence
- Differentiated preservation actions
- Volume of data

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AIT 2015 Partner Survey

- 80% of respondents do not currently store local copies of their WARC files
  - 53% plan on doing so in the future
  - 41% are considering this for the future
- 20% ingest their WARCs into a digital preservation system or long-term repository
- 14% create metadata for WARC files

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PREMISE
BEACH

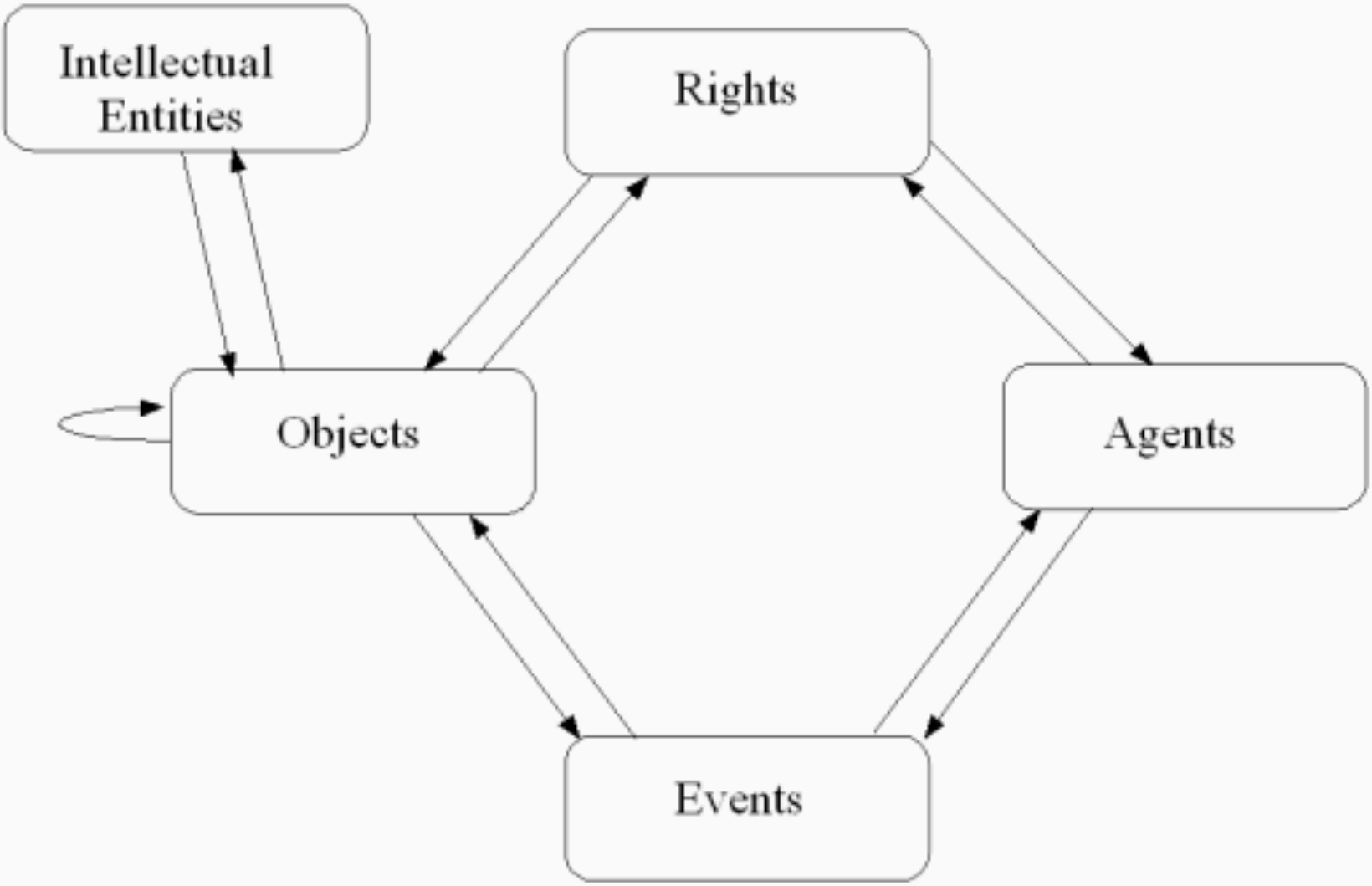
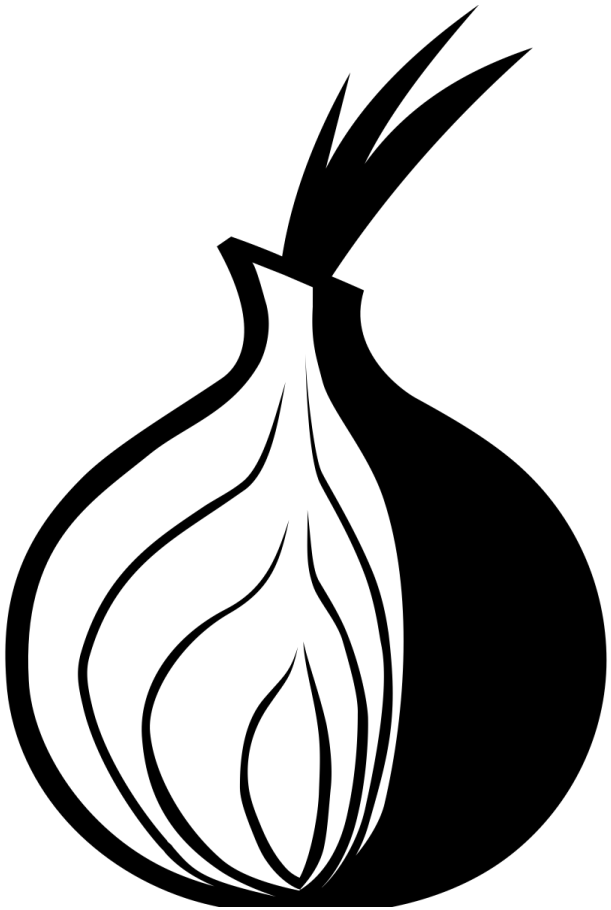


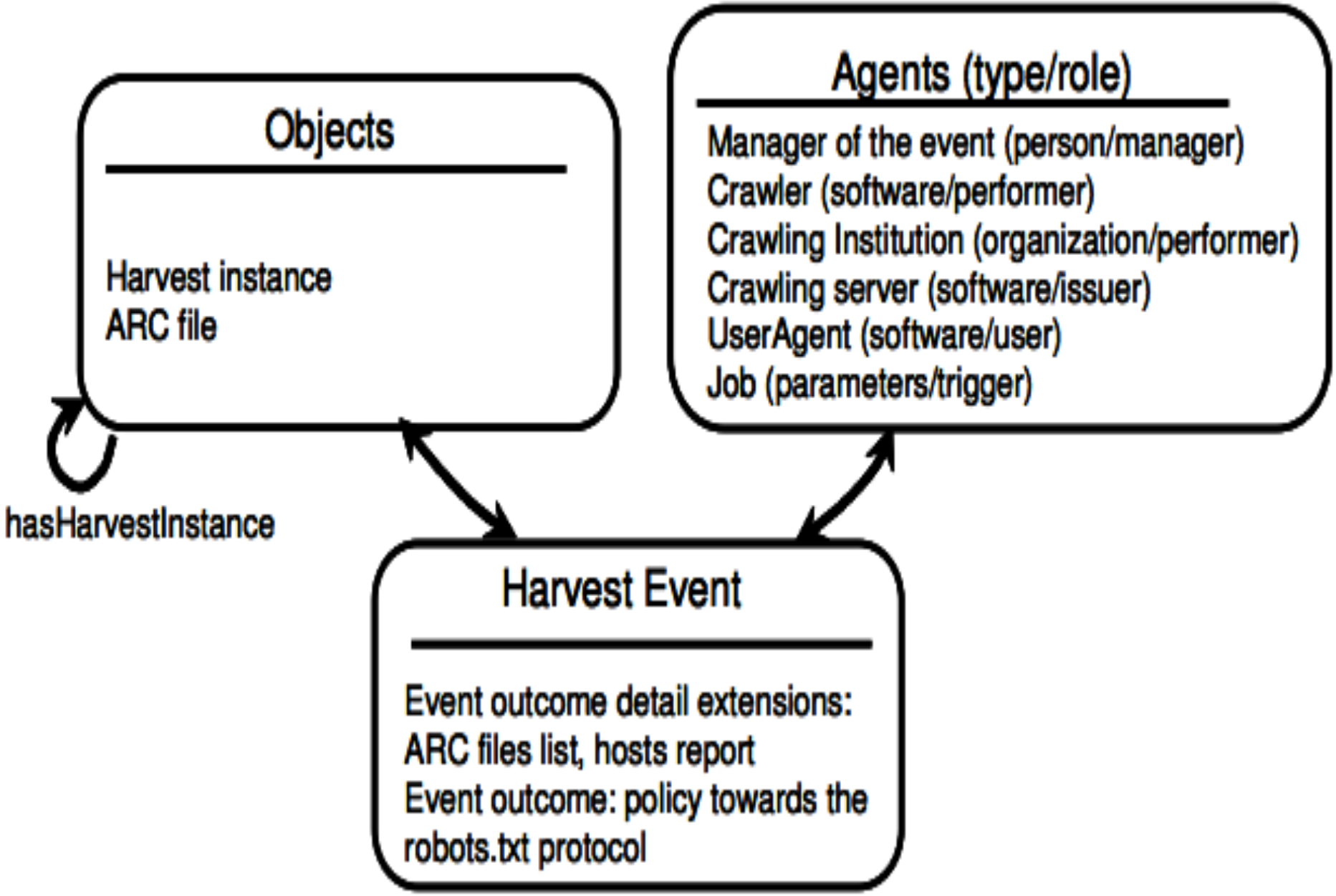
Figure 1: The PREMIS Data Model

The "Onion" Model



- objectCharacteristics
- compositionLevel
- Logical distinctions?
- *"The individual filestream objects are not composition levels of the package file object. They should be considered separate objects, each with their own composition levels."*

- WARC
  - Record
    - Record type
      - Header
        - Content block
          - Payload
            - Bitstream
              - On and on



Clement Oury, Sebastien Peyrard. From the World Wide Web to digital library stacks (2011)

<structMap> & <admSec>

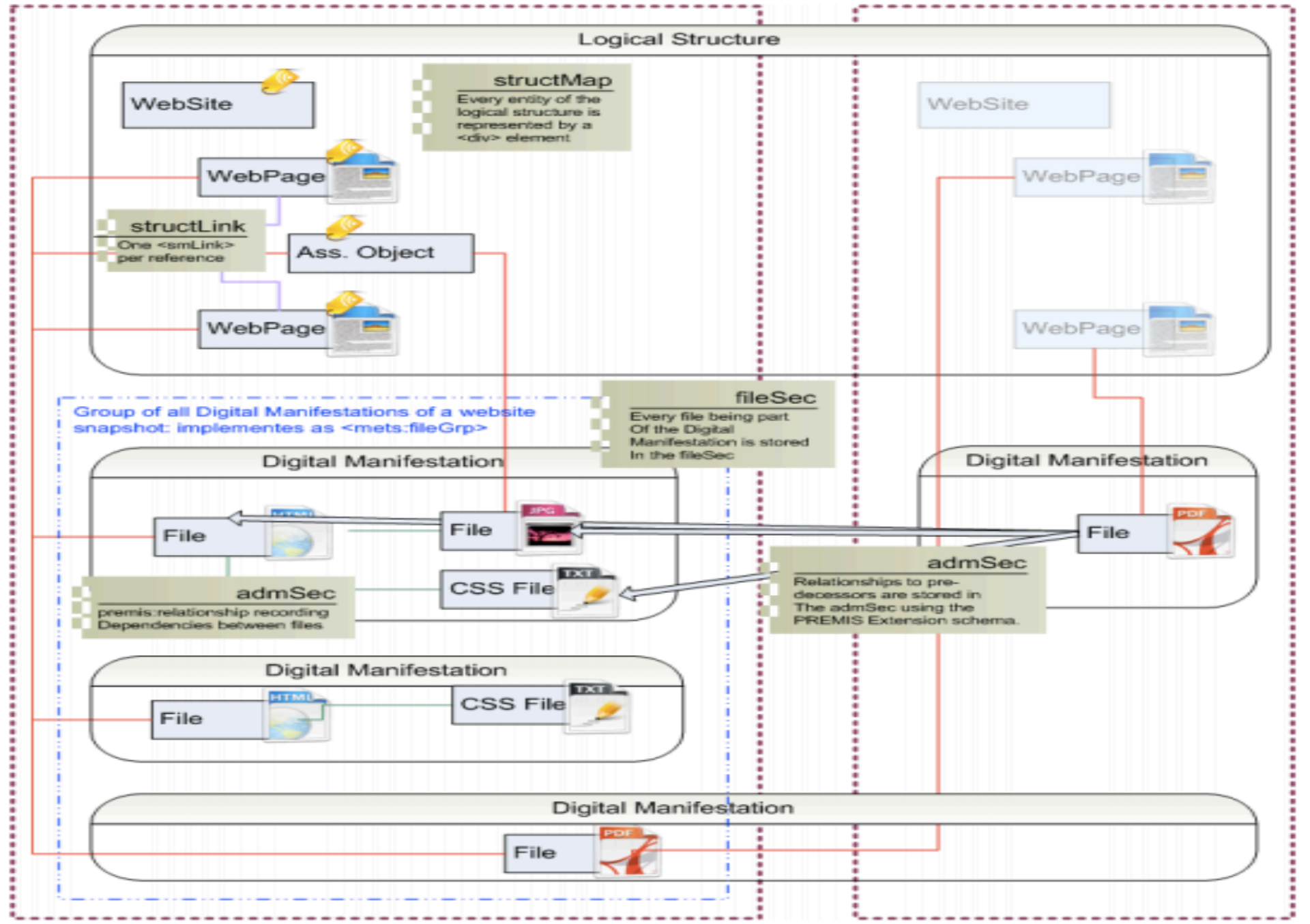
```
<mets:structMap TYPE="logical">
<!-- the  website containing  webpages -->
   <mets:div TYPE="WEBSITE">

      <!-- the first webpage -->
      <mets:div TYPE="WEBPAGE"/>

      <! definitios of image -->
      <mets:div TYPE="ASSOCIATEDOBJECT" />

      <!-- the second webpage -->
      <mets:div TYPE="WEBPAGE" />

  </mets:div>
</mets:structMap>
```

Figure 2. <structMap> in METS representing the logical structure of a harvested website

```
<premis:event>

    <premis:eventIdentifier>

      <premis:eventIdentifierType>local
       </premis:eventIdentifierType>

     <premis:eventIdentifierValue>event01
       </premis:eventIdentifierValue>

    </premis:eventIdentifier>

    <premis:eventType>migration
     </premis:eventType>

    <premis:eventDateTime>2006-07-16T19:20:30
    </premis:eventDateTime>

    <premis:linkingAgentIdentifier>

     <premis:linkingAgentIdentifierType>local
     </premis:linkingAgentIdentifierType>

    <premis:linkingAgentIdentifierValue>
      agent001
     </premis:linkingAgentIdentifierValue>

    </premis:linkingAgentIdentifier>

</premis:event>
```

Figure 5. Representation of an event in PREMIS

Marcus Enders. A METS based information package for long term accessibility of Web Archives. (2010)



Marcus Enders. A METS based information package for long term accessibility of Web Archives. (2010)


THE GOGGLES
THEY DO NOTHING
made on imgur

Premises that complicate PREMIS

- Little local acquisition
- Format opacity
- Concatenation / compression
- Crawler variance
- Policies / Agents
- Scale, scale, scale

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"Practical" Approaches

- Data redundancy over metadata granularity
- Utilize Crawl/Crawler-specific resources
  - mimetype-report.txt
  - crawl-report.txt
  - CDX index
- Utilize additional crawl reporting
  - Host reports, etc
- Decomposition levels?
- Simplify events/agents/objects

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Closing/Discussion Thoughts

- Forecasting Obsolescence
- Collection vs. Control
- Institutional vs. Technological
- Lightweight Tonnage of Data

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THANKS!

Jefferson Bailey, Internet Archive
jefferson@archive.org | @jefferson_bail
Maria LaCalle, Internet Archive
maria@archive.org

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